A COOLING DEVICE FOR A FUEL-RECIRCULATION CIRCUIT

PCT/EP2004/052259

TECHNICAL FIELD

The present invention relates to a cooling device for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle.

BACKGROUND ART

Recently, there has been a widespread use of injection systems that enable reduced levels of consumption to be obtained but call for high values of pressure and hence of temperature of the fuel.

Generally, the injection systems referred to comprise pumps sized for supplying a quantity of fuel greater than the one actually used. The amount in excess is recirculated to the tank, where, however, the upper limit of the input temperature of the fuel is set by current standards at a value lower than that of the output temperature from the injection system.
For these reasons a cooling device designed to dissipate the heat of the fuel is used.

As is known, there exist air-cooling devices comprising a coil traversed by the fuel and a thin radiant plate, set in contact with the coil itself and having the function of increasing the dissipation of heat. In particular, the radiant plate comprises a multiplicity of fins, which are semi-blanked and bent outwards in order to favour heat exchange by interacting with the current of air in relative motion with respect to the vehicle.

However, the cooling devices described above present the drawbacks of having large overall dimensions and of requiring a procedure of assembly of the radiant plate that is critical for the purposes of obtaining an optimal heat exchange.

DISCLOSURE OF INVENTION

The purpose of the present invention is to provide a cooling device that is free from by the drawbacks referred to above.

The purpose of the present invention is achieved via a cooling device for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle, as defined in Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention there is now described a preferred embodiment, purely by way of non-limiting example, with reference to the annexed drawings, in which:

- Figure 1 illustrates a cooling device according to a perspective view;
- Figure 2 is an enlarged longitudinal section of a detail of the cooling device according to the line II-II of Figure 1; and
- Figure 3 is a cross-sectional view according to the line III-III of Figure 1 of the cooling device according to a different embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

In Figure 1 designated as a whole by 1 is a cooling device for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle.

The cooling device 1 comprises: a pipe 2 defining a rectilinear cavity 3 of axis A, supporting a finned radiant body 4 and having a side wall 5; two end couplings 6, which can be hermetically connected to the pipe 2; and guide means 7 for guiding the flow of fuel, which are housed within the cavity 3.

The end couplings 6 have a substantially conical shape and have respective openings 8, arranged on respective vertex portions 9 for connecting the cooling device 1 to the recirculation circuit.

The pipe 2 and the finned body 4, which comprises a multiplicity of fins 10, are made of conductive material, for example aluminium, and can be made integrally via processes of plastic deformation, for example by extrusion.

The guide means 7 are made of polymeric material and comprise end portions 11, which have a conical profile, with an angle of opening greater than that of the end couplings 6 and delimiting, together with the couplings 6 themselves, an input chamber 12 for inflow of the fuel and an outlet chamber set downstream of the input chamber 12.

The body 7 moreover comprises, integrally with the end portions 11, an elongated body 14, which, circumferentially, has one or more projections 15, either helical or rectilinear, which start from the input chamber 12 and terminate in the outflow chamber, delimiting respective grooves 16. The internal surface of the cavity 3, and the projections 15 co-operate by mutual interference, thus providing a fixed connection of the guide means 7 within the pipe 2 and, moreover, one or more internal channels 17, which connect the input chamber 12 with the outlet chamber.

Operation of the cooling device 1 is described in what follows.

The fuel at high temperature arriving from the injection system enters the input chamber 12 through the opening 8 and is conveyed to the inlet of the internal channel or internal channels 17 from the conical end portion 11 of the guide means 7. The internal channels 17 modify the geometry of the passage section, enabling the fuel to moisten a larger surface and, in the case of helical channels, increase the stay time and the turbulence of the motion, thus increasing heat exchange. Furthermore, the presence of the multiplicity of fins 10, in so far as these offer a large surface, enables dissipation of the heat to the external environment. Consequently, the fuel

reduces its own temperature and finally, once collected in the outflow chamber, is conveyed to the tank.

From an examination of the characteristics of the cooling device 1 built according to the present invention, the advantages that it makes possible are evident.

In particular, the internal channels 17 enable an increase in heat exchange, at the same time maintaining compact dimensions. Furthermore, the radiant body 4 is integral with the pipe 2, thus eliminating the problems linked to the type and to the thermal efficiency of the means of connection, and has a multiplicity of fins that increase the power of dissipation.

Finally, the fact that the elongated body 14 and the pipe 2 are made of materials which have different coefficients of thermal expansion enables the formation of the internal channels 17, in which the passage section can vary with the temperature. In particular, when, in conditions of low temperature, the fuel has a greater density, the passage section of the internal channels 17 tends to increase, so facilitating advance of the flow of fuel.

Finally, it is clear that modifications and variations can be made to the cooling device 1 described and illustrated herein, without thereby departing from the sphere of protection of the present invention, as defined in the annexed claims.

In particular, the projections 15 can be carried by the pipe 2 (Figure 3), which may for example be made of a single piece via a process of extrusion.

According to this second embodiment, moreover, the side surface of the elongated body 14 has a profile, for example circular, which enables coupling to the projections 15 of the pipe 2, thus forming the internal channels 17.